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Vegetable Gardening Guide



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B-1252, *Insect Control Guide for Organic Gardening*

B-5078, *Earth-Kind Gardening Guides*

L-2242, *Growing Herbs in Texas*

MP-1150, *Vegetable Gardening in Containers*

MP-954, *Disease Prevention in the Home Garden*

L-781, *Control of Plant Parasitic Nematodes around the Home and Garden*

B-1613, *Specialty Vegetables in Texas*

Texas Home Vegetable Gardening Guide

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Home gardening continues to grow in popularity. Most gardens are found in urban settings. An estimated 1 of every 3 families engages in some type of gardening. Texas gardeners are fortunate in being able to produce high quality, nutritious vegetables year-round in most areas of the state. Successful gardening is based on a few basic rules and on making practical and timely decisions.

Garden Site

Although many urban gardeners have little choice, selecting an appropriate garden site is essential to the success of a garden. The ideal area is exposed to full or near-full sunlight, with deep well-drained, fertile soil. The location should be near a water source and free of competition from existing shrubs or shade trees. By modifying certain cultural practices and selecting adaptable crops and varieties, however, almost any site can become highly productive.

In many areas of the state, poor soils prohibit optimum vegetable production. Heavy clays with

poor drainage are special problems that may be addressed by using raised beds. Raised beds should be 12" to 18" in height, 4' to 6' wide and 8' to 10' long. Materials such as cinder blocks, used railroad ties and/or landscape timbers are ideal for building a raised bed. Once constructed, the beds should be filled with a growing medium. A mixture of 1/3 topsoil, 1/3 sand or coarse perlite and 1/3 compost or bark mulch provides excellent growth for most vegetables.

Crop Selection

One of the first decisions a home gardener must make is what vegetables to grow and how much to plant. Table 1 lists crops suited to small and large gardens. Consider only those crops that return a large volume of produce for the time and space available. Vine crops such as watermelon, cantaloupe and winter squash require a large area per plant. Consequently, these are poor choices for gardens with limited space. Locating the garden near a fence or trellis may allow a gardener to produce vine crops in less space than normally required. The decision about the amount of a vegetable to produce depends on your family needs.

Table 1. Home garden vegetables suggested for gardens of varying sizes.

Small garden vegetables		Large garden vegetables	
Beet	Green bean	Cantaloupe	Potato
Broccoli	Lettuce	Collards	Pumpkin
Bush Squash	Onion	Cucumber	Sweet corn
Cabbage	Parsley	Mustard	Sweet potato
Carrot	Pepper	Okra	Watermelon
Cauliflower	Radish		
Eggplant	Spinach		
Garlic	Tomato		

Equally as important as your choice of crop is variety. The wrong variety may yield disappointing results regardless of the time and effort spent in the garden. A list of recommended varieties is presented in the appendix.

If your garden is not in an area that gets full or near full sunlight, your crop selection may be limited to cool season crops such as broccoli, mustard and cabbage, which are well adapted to low light conditions. Table 2 lists light requirements of common garden vegetables.

Table 2. Light requirements of common vegetables.

Requires bright sunlight			
Bean	Eggplant	Pepper	Squash
Cantaloupe	Okra	Potato	Tomato
Cucumber	Onion	Pumpkin	Watermelon
Tolerates partial shade			
Beet	Cabbage	Kale	Radish
Broccoli	Collards	Lettuce	Spinach
Brussel's sprouts	Cauliflower	Mustard	Turnip

Garden Plan

Just as an architect needs a plan to construct a building, a gardener must have a plan. Careful planning reduces work, lessens the incidence of crop failure and increases returns on the labor and money invested in the garden.

Long-season crops require long growing periods. Plant these crops in areas of the garden where they will not interfere with the care and harvest of shorter season crops. Plant tall crops where they will not shade smaller growing crops. Plant crops such as okra, sweet corn, trellised tomatoes and pole beans on the north side of a garden to avoid shading smaller plants such as pepper, squash, lettuce, onion and radish. It is also a good idea to group crops according to their rate of maturity. Table 3 shows the maturity rate of selected vegetables. Grouping plants by maturity enables a gardener to make the maximum use of limited garden space. As mature crops are removed, they can be replaced by other crops with similar maturity rates. It is also a good practice to plant crops that are unrelated to the previous crops.

This crop rotation reduces damage from soil-borne pathogens (diseases or pests). For example, follow early beans with beets, bush squash or bell pepper.

Table 3. Rate of maturity of selected vegetables.

30 - 60 days		
Beet	Mustard	Summer squash
Bush bean	Radish	Turnip tops
Leaf lettuce	Spinach	Turnip roots
30 - 60 days		
Broccoli	Green onion	Okra
Chinese Cabbage	Kohlrabi	Parsley
Carrot	Lima bean	Tomato
Cucumber	Bush bean	
60+ days		
Brussel's sprouts	Cauliflower	Pumpkin
Bulb onion	Eggplant	Sweet potato
Cabbage	Garlic	Tomato
Cantaloupe	Irish potato	Watermelon

When to Plant

Proper planting time is important to producing maximum yield and plant quality. Consult the Planting Date Guide in the appendix for recommended planting times for home gardens in your area. Usually home gardens can be planted 10 days to 2 weeks earlier than commercial fields because

they are protected by existing buildings, trees and shrubs in the home landscape. Figures 1 and 2 show average dates for first and last freeze (32 degrees F) for various regions in Texas. Those dates and the information found in the Planting Date Guide can help determine optimum planting dates.

Soil Preparation

Many garden sites do not have deep, well drained, fertile soils that are ideal for vegetable growing. As a result, these soils must be altered to provide good drainage and aeration. If the soil is a heavy clay, adding organic matter or sand may help improve the soil's physical condition.

Apply 1 to 2 inches of good sand and 2 to 3 inches of organic matter to the garden site surface and turn under in late winter or early spring. Work on the soil's condition may be required over several years to obtain adequate conditions for a productive garden. Periodically add organic matter such as com-

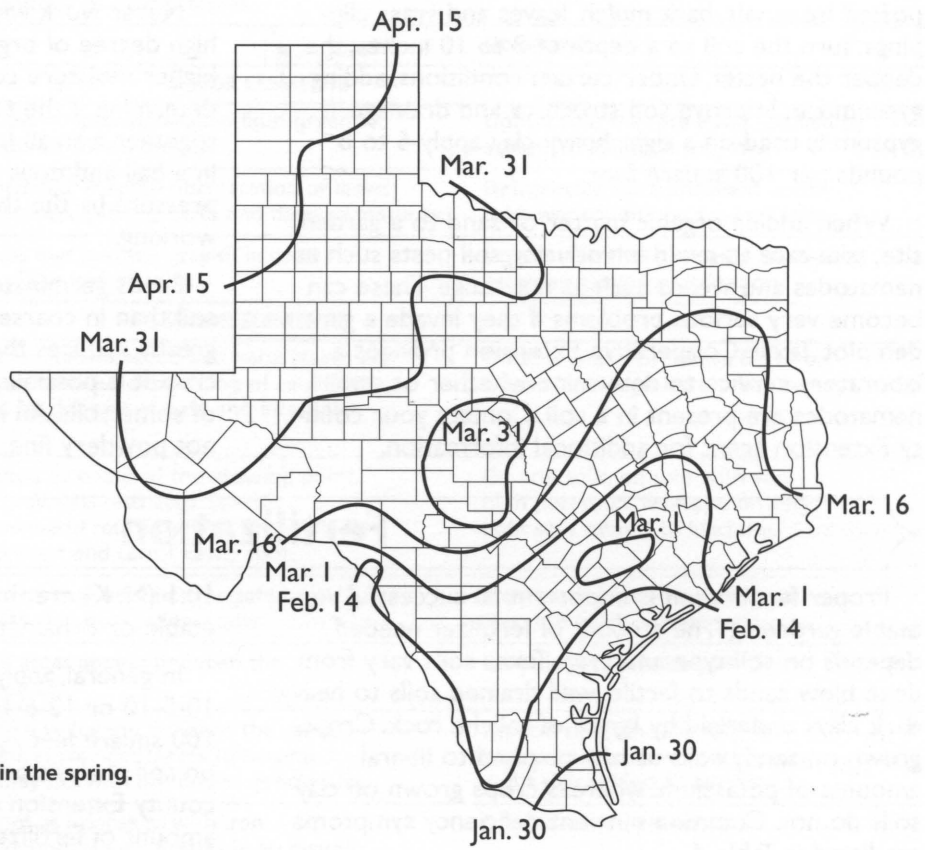


Figure 1. Average date of last 32° F freeze in the spring.

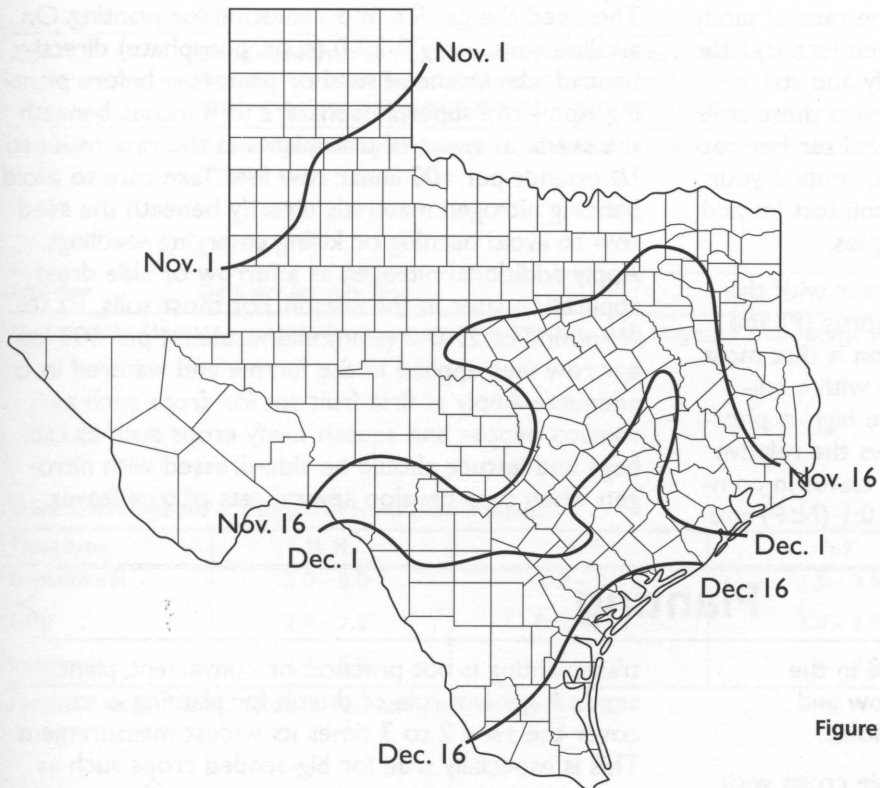


Figure 2. Average date of first 32° F freeze in the fall.

posted materials, bark mulch, leaves and grass clippings. Turn the soil to a depth of 8 to 10 inches; the deeper the better. Under certain conditions, adding gypsum can improve soil structure and drainage. If gypsum is used on a tight heavy clay, apply 6 to 8 pounds per 100 square foot.

When adding organic matter or sand to a garden site, take care to avoid introducing soil pests such as nematodes and weeds such as nut sedge. These can become very serious problems if they invade a garden plot. Texas Cooperative Extension provides a laboratory service to determine whether or not nematodes are present in a soil. Contact your county Extension agent for additional information.

Never work wet garden soil. Soils containing a high degree of organic matter can be worked at higher moisture content than heavy clay soils. To determine if the soil is suitable for working, squeeze together a small handful of soil. If it sticks together in a ball and does not readily crumble under slight pressure by the thumb and finger, it is too wet for working.

Seeds germinate more readily in well prepared soil than in coarse, lumpy soil. Thorough preparation greatly reduces the work of planting and caring for a crop. It is possible, however, to overdo preparation of some soils. An ideal soil for planting is granular, not powdery fine.

Fertilization

Proper fertilization is important to successful vegetable gardening. The amount of fertilizer needed depends on soil type and crop. Texas soils vary from deep blow sands to fertile, well drained soils to heavy, dark clays underlaid by layers of caliche rock. Crops grown on sandy soils usually respond to liberal amounts of potassium, whereas crops grown on clay soils do not. Common nutrient deficiency symptoms are listed in Table 4.

Heavy clay soils can be fertilized considerably heavier at planting than can sandy soils. Heavy clay soils and those high in organic matter can absorb and store fertilizer at three to four times the rate of sandy soils. Although poor thin, sandy soils need fertilizer the most, they cannot be fertilized as heavily and still maintain plant safety. Consequently, fertilize these soils more often but with lighter doses of fertilizer. For recommendations regarding fertilizer rates, contact your county Extension agent and request a soil test kit and instructions on where to send the samples.

Most gardens need a complete fertilizer with the proper analysis of nitrogen (N), phosphorus (P) and potassium (K). A common misconception is that most Texas garden soils need to be fertilized with a balanced fertilizer such as 13-13-13 or one high in phosphorus such as 12-24-12. Table 5 shows the relative percentages of nutrients found in plant leaves in common garden plants. Nutrient ratios of 10:1 (N:P) and

10:1 (N:K) are the same regardless if it is a fruit, vegetable or ornamental plant.

In general, apply a complete fertilizer such as 10-5-10 or 12-6-12 at the rate of 1 to 2 pounds per 100 square feet. Amounts to apply should be based on soil analysis performed with the assistance of your county Extension agent. After determining the proper amount of fertilizer for pre-plant application, apply the fertilizer a few days before planting. Spade the garden plot, spread the fertilizer by hand or with a fertilizer distributor and then work the soil one or two times to properly mix the fertilizer with the soil. Then bed the garden in preparation for planting. On alkaline soils, apply 0-20-0 (superphosphate) directly beneath the intended seed or plant row before planting. Apply the superphosphate 2 to 4 inches beneath the seeds or roots of transplants at the rate of $\frac{1}{4}$ to $\frac{1}{2}$ pounds per 100 linear row feet. Take care to avoid banding nitrogen materials directly beneath the seed row to avoid burning or killing emerging seedlings. Apply additional nitrogen as a furrow or side dress application later in the season. For most soils, $\frac{1}{2}$ to $\frac{3}{4}$ pound of 21-0-0 (ammonium sulfate) per 100 linear row feet, applied in the furrow and watered in, is adequate. Apply at first fruit set for crops such as tomato, pepper and squash. Leafy crops such as cabbage and lettuce should be side-dressed with nitrogen when they develop several sets of true leaves.

Planting

Plant your garden as early as possible in the spring and fall so the vegetables will grow and mature during the best weather conditions.

Transplanting or establishing vegetable crops with seedlings allows earlier harvesting and extends the productive period of many vegetable crops. Where

transplanting is not practical or convenient, plant seeds. A general rule of thumb for planting is to cover the seed 2 to 3 times its widest measurement. This is especially true for big-seeded crops such as green beans, sweet corn, cucumber, cantaloupe and watermelon. For smaller-seeded crops such as car-

Table 4. Common symptoms of nutrient deficiencies in vegetables.

Nutrient	Plant Symptoms	Occurrence
MAJOR ELEMENTS		
Nitrogen	Lower leaves first to show symptoms, become light green to yellowish and size is reduced. Weak growth	Lighter soils that are easily leached by excessive rainfall or irrigation
Phosphorous	Stems are thin and shortened. Purplish discoloration of leave, shortened internodes. Stunted plant growth and delayed maturity.	Deficiencies more prevalent under cold, wet conditions. Low pH soils.
Potassium	First seen on older leaves that become grayish in color followed by scorching of the leaf margins	Lighter soils that are easily leached by excessive rainfall or irrigation.
MINOR ELEMENTS		
Boron	Growing points die; stems are shortened and hard; leaves are distorted. Specific symptoms include browning of cauliflower, cracked stems of celery, black heart of beet and internal browning of turnip.	On soils with a pH above 6.8 or on crops with a high boron requirement.
Calcium	Stem elongation restricted by death of the growing point. Root tips die and root growth is restricted. Specific symptoms include blossom-end rot of tomato, brown heart of escarole, celery blackheart and carrot cavity spot.	On acid soils, on soils with very high potassium levels, or on very light soils subject to leaching.
Copper	Yellowing of leaves. Leaves may become elongated. Onion bulbs are soft with thin pale yellow scales.	Most cases of copper deficiency occur on muck or peat soils.
Iron	Distinct yellow or white areas appear between the veins of the youngest leaves.	On soils with pH above 8.
Magnesium	Initially, older leaves show yellowing between the veins, continued deficiency causes younger leaves to become affected. Older leaves may fall with prolonged deficiencies.	On acid soils, on soils with very high potassium levels, or on very light soils subject to leaching.
Manganese	Yellow mottled areas, not as intense as with iron deficiency, appear on younger leaves. Results in an overall pale appearance. In beets foliage becomes densely red. Onions and corn show narrow stripping of yellow.	On soils with a pH above 6.7.
Molybdenum	Pale distorted very narrow leaves with some inter-veinal yellowing on older leaves. Whip-tail of cauliflowers, small open loose curds.	On very acid soils.
Zinc	Small reddish-brown spots on cotyledon leaves of beans. Green and yellow broad striping at base of corn leaves. Inter-veinal yellowing with marginal burning on bests	On wet soils in early spring; often related to heavy phosphorous fertilization.
Sulphur	General yellowing of younger leaves and reduced growth growth	On very sandy soils, low in organic mater, especially following continued use of sulphur-free fertilizers and especially in areas that receive little atmospheric sulphur.
Chlorine	Deficiencies very rare	Usually seen under lab conditions

Source: Univ. Florida Vegetable Production Guide. SP# 170. Don Maynard and George Hochmuth.

Table 5. Average N-P-K content of horticultural plants.

Plant type	% N	% P	%K	N:P	N:K
Ornamental	2.0 – 6.0	0.2 – 0.7	1.5 – 3.5	10.1:1	1.6:1
Fruit	2.0 – 7.2	0.15 – 0.3	1.0 – 2.5	10.1:1	1.5:1
Vegetable	2.4 – 5.6	0.3 – 0.7	1.5 – 4.0	10.1:1	1.5:1

Fertilizer ratios needed to equal leaf analysis: 15 – 3.5 – 11.25

rot, lettuce, or onion, an average planting depth of 1/4 to 1/2 inch is usually adequate. Seed the plants fairly thickly and then thin out at a later date. Avoid letting the soil dry or crust during germination, but do not over-water. Table 6 shows the number of days from planting to expected emergence.

Table 6. Days from planting to emergence under good growing conditions.

Vegetable	Days to emergence
Bean	5 – 10
Beet	7 – 10
Broccoli	5 – 10
Cabbage	5 – 10
Carrot	12 – 18
Cauliflower	5 – 10
Corn	5 – 8
Cucumber	6 – 10
Eggplant	6 – 10
Lettuce	6 – 8
Okra	7 – 10
Onion	7 – 10
Peas	6 – 10
Parsley	15 – 21
Pepper	9 – 14
Radish	3 – 6
Spinach	7 – 12
Squash	4 – 6
Tomato	6 – 12
Turnip	4 – 8
Watermelon	6 – 8

Avoid transplanting too deep or too shallow, especially if plants are in containers such as peat pots. Deep planting can cause developed roots to abort, and shallow planting can cause root desiccation, especially if containers such as peat pots are used. Peat pots serve as moisture wicks, which may cause soil drying and root death. Some crops are easily transplanted bare-root, while others are best transplanted in containers (Table 7).

Table 7. Vegetables classified according to ease of transplanting.

Easily transplanted	Moderately easy	Difficult
Broccoli	Celery	Carrot
Cabbage	Eggplant	Corn
Cauliflower	Okra	Peas
Lettuce	Spinach	Turnip
Onion		
Pepper		
Tomato		

When transplanting plants such as tomato or pepper, use a starter solution. Starter solutions may be purchased at local nurseries or can be home-made by mixing 1/4 to 1/2 cup of fertilizer such as 10-20-10 in 5 gallons of water. Use the lower rate on light, sandy soils. Apply 1/2 to 1 pint of starter solution per transplant hole based on plant size. This prevents the plants from drying out and provides adequate nutrients for young, growing plants.

Watering

Apply enough water to penetrate the soil at least 6 inches. Most gardens require moisture equal to 1 inch of rain a week during the growing season. Light sandy soils generally need more frequent watering than heavier dark soils. If the water source contains

high levels of salts, do not use sprinkler irrigation because salt can injure foliage, especially during the heat of the day. Drip irrigation is preferred. In addition, drip irrigation uses less water and is ideally suited for use with mulches.

Weed Control

A long handled hoe is the best tool for controlling undesirable plants (weeds) in a vegetable garden. Chemical weed control is usually unsatisfactory because weed control chemicals generally target only specific weeds. In addition, the chemicals needed for such weeds are often not labeled for use on

the vegetables typically found in most home gardens. Cultivate or hoe shallowly to avoid injuring roots lying near the soil surface. Control weeds in the seedling stage to prevent them from developing seeds and re-entering the garden site. Mulch is also an effective means of weed control.

Mulching

Mulching can increase yield, conserve moisture, prevent weed growth, regulate soil temperature and reduce losses from soil rots. Straw, leaves, grass clippings, compost, bark and sawdust make excellent organic mulches. Organic mulch incorporated into the soil after a crop is harvested also improves soil tilth (pulverization), aeration and drainage. Although the amount of organic matter to use depends upon

the type, 1 to 2 inches applied to the surface around growing plants should be adequate.

When turning organic mulches under for subsequent crops, add additional fertilizer at the rate of 1 pound per 100 sq. ft. This will activate soil organisms and reduce the drain of nitrogen from the decomposition of organic matter caused by soil microorganisms.

Pest Control

Diseases and insects are sources of concern to Texas gardeners. Long growing seasons and relatively mild winters encourage large insect populations to develop. As a result, these pests create serious challenges for gardeners. Avoid spraying when possible. If necessary, use only approved insecticides, and exercise care when spraying. Apply chemicals only to those vegetable crops for which they are labeled. Read and follow the instructions on the labels of pesticide containers. When used as described, pesticides pose no serious threat to the environment or to gardeners.

Disease control is a preventative process rather than a curative one. Once disease symptoms are evi-

dent, it is often too late damage has already been done. Therefore, gardeners should become familiar with the diseases common to vegetables being produced and with the environmental conditions that may encourage those diseases. Cool, damp conditions are conducive to the development of many common garden diseases. Watch for disease symptoms and spray with the appropriate chemical when the first evidence of a disease is found or when environmental conditions are right for a disease to develop. Publications on disease and insect identification and control are available from your county Extension agent.

Harvesting

For the greatest enjoyment of your home vegetable garden, harvest vegetables when they are mature. A vegetable's full flavor develops only at peak maturity, resulting in the excellent taste of vine-ripened tomatoes, tender green beans and crisp, flavorful lettuce. For maximum flavor and nutritional content, harvest the crop the day it is to be consumed, canned or frozen. Tips on harvesting selected vegetables are presented below.

Asparagus

Cut, just below soil line, shoots that are 6 to 8 inches tall. Stalks should be fresh and firm with compact, closed tips. Angular or flat stalks are apt to be woody. Store in the refrigerator without washing.

Beans — broad, Lima, green shell

Harvest when pods are well filled but have not begun to yellow. Keep cold and humid and use as soon as possible.

Beans, snap

For maximum tenderness, harvest before maturity when pods are almost full size but before the seeds begin to bulge. Pods should be free from scars and without strings when snapped. Keep cold (45 degrees to 50 degrees F) and humid, and use as soon as possible. Washing before storage helps retain moisture content.

Beets

Pull early beets when roots are approximately 2 inches in diameter. If allowed to get larger, they become woody, especially in warm, dry weather. Remove all but 1 1/2 inches of tops on late crop beets. Wash and refrigerate immediately.

Broccoli

Harvest when flower heads are fully developed but before individual flower buds are open enough to show the bright yellow flower. Cut off 6 to 7 inches

below flower heads. The small, tender leaves are also edible and quite nutritious. Store in the cold section of the refrigerator.

Brussels sprouts

Harvest when sprouts (buds) at the base of the plant become solid. Remove buds higher on the plant as they become firm, but do not strip leaves from the plants since they are necessary for further growth. Store in the cold section of the refrigerator.

Cabbage

Harvest when head becomes solid. Outer leaves should possess a uniform green or purple color, depending upon type. Excessive water uptake by plant roots causes splitting. To prevent mature heads from splitting prior to harvest, twist the plants enough to break several roots. Store in crisper and use within 1 to 2 weeks.

Carrots

Always pull the largest carrots in a row. Remove tops and wash before transferring to refrigerated storage.

Cauliflower

Harvest when curds (aborted flower heads) are full size (6 to 8 inches in diameter) but still compact, white and smooth. Curds exposed to sunlight become cream-colored, rough in appearance and coarse in texture. When curds are 3 to 4 inches wide, tie the tips of the outer leaves loosely above the curd to exclude sunlight (blanch). Chill immediately after harvest.

Celery

Cut when plants become 12 to 15 inches tall. While the plants are still young and tender, the lower leaves can be removed and used in salads, soups and cooked dishes. Wash and store in the refrigerator.

Corn, sweet

Harvest when silks begin to darken and dry out. As kernels fill out toward the top, ends become more blunt instead of pointed. Pick ears in the milk stage (milk-like substance oozes from kernels when crushed). Standard type sweet corn varieties are very susceptible to rapid sugar to starch conversion; therefore, chill immediately after harvest. The newer SE (sugary enhanced) and SH₂ (shrunken gene) varieties tend to retain their sugar content for longer durations. The SE types have extremely high sugar

contents. As a result, longer periods of time are required to convert all of the sugar to starch. The SH₂ varieties have sugars that do not readily convert to starch. Therefore, refrigeration is not needed to maintain their sweetness.

Cucumber

Harvest when fruits are bright green and firm but before seed coats harden. Slicer (salad) types are generally harvested when fruits are approximately 2 inches in diameter. Pickling types can be harvested when fruits are as small as the little finger on ones hand. Harvest fruits before the development of any yellow color in the peel.

Eggplant

Harvest when fruits are near full size, approximately 4 to 8 inches in diameter, depending upon type and variety, but still firm and bright in color. Older fruits become dull colored, soft and seedy. Store under cool, humid conditions.

Garlic

Harvest when foliage loses color and tops begin to fall over. Store in a cool, dry place.

Gourds

Harvest edible varieties when fruits are 8 to 10 inches long, young and tender; harvest ornamental varieties when fruits are mature and fully colored with firm skin but prior to frost.

Greens

There are many kinds of greens, including collards, turnip, mustard, kale, Swiss chard and beet dandelions. Break off outer leaves when they are 6 to 10 inches long and before they start to yellow. Avoid wilted or flabby leaves. Wash and chill immediately.

Horseradish

Harvest when roots have reached maximum size in late fall or early spring.

Jerusalem artichoke

Dig tubers after early fall frosts or in very early spring before new growth begins. Wash and refrigerate.

Kohlrabi

Harvest when bulbs (thickened stems) reach 2 to 3 inches in diameter. Store in refrigerator.

Lettuce

Harvest leaf varieties when outer, older leaves are 4 to 6 inches long, heading types when heads are moderately firm. Older, outer leaves may be removed from plants of either leaf or head lettuce as soon as the leaves are 4 to 6 inches long. New leaves provide a continuous harvest of tender, tasty lettuce until hot weather brings on bitter flavor and seed stalk development. Wash and refrigerate.

Melons

Honeydew — Harvest when yellowish to creamy white with a soft velvety feel. The rind should be slightly soft at the blossom end and have a faint, pleasant odor.

Muskmelon — Harvest at three quarters to full slip (when stem separates readily from the fruit under moderate pressure and leaves a circular depression). Outer rind should not have any green coloration. If fully ripe, store in refrigerator; if not, in a cool dry place.

Okra

Three to 4 inches is an optimum length for harvesting before pods reach the hollow, puffy stage and while they are easy to break or cut from the stalk. Pick okra every day or two for continued harvest of tender pods. Chill immediately.

Onion

Harvest when 80 percent of the plants have tops that have fallen down. Usually bulbs with 2 to 4 inches in diameter are ideal. Remove adhering soil. Do not harvest bulbs when the soil is wet. Let dry for a day or two with tops attached, then clip 1 inch above the bulb before storing in a cool dry place. Harvest green onions when 6 to 8 inches tall.

Parsley

Cut when older leaves are 3 to 5 inches long. Continue to remove outer leaves of tender parsley until heavy winter frosts. Refrigerate.

Peas

If you expect to shell the peas, harvest the pods when they are shiny green and fully developed. Overly mature peas have poor quality. For edible-podded varieties (snow or Chinese peas), harvest when pods are fully developed, approximately 3 inches long, before seeds are more than one-half developed. Deterioration proceeds rapidly at high temperatures. Wash and chill immediately.

Peppers

Harvest bell types when they are well-formed, dark shiny green and firm to the touch. Immature fruits are soft, pliable, thin walled and pale. Harvest jalapenos in a similar manner. Mature fruits are usually 2 to 3 inches in length. Most pepper varieties turn orange or red when mature. Store at 45 degrees to 50 degrees F.

Potatoes, Irish

Harvest potatoes when tubers are 2 to 3 inches in diameter or when foliage begins to turn yellow. Tubers are suitable for harvest at any time based on gardener's preference. For instance, "new" potatoes can be harvested when tubers are 1" in diameter. It is best to let tubers stay in the garden for several hours after digging to let the skins set. This will help prevent "feathering" or peeling of skin and reduce bruising. After harvest cover tubers with the vines to prevent greening. Remove soil and store in a cool dry area.

Potatoes, Sweet

Harvest late in the fall but before the first frost. Lift to avoid cuts, bruises and broken roots. Remove adhering soil but do not wash. Cure for 14 days in a warm, well ventilated location. This will help to prevent bruising and storage root rot. Store in a cool, dry place.

Pumpkins

Pick when fruits are full size, the rind is firm and glossy and the bottom of the fruit (portion touching the soil) is cream- to orange-colored. Store in cool, dry area.

Radishes

Harvest when root is approximately 1 inch in diameter. Wash and chill immediately.

Rutabagas

Harvest when roots reach full size but before heavy frosts. Thin early to ensure rapid, uniform growth and highest quality. Refrigerate.

Spinach

Harvest based on gardener's preference. Can be harvested when true leaves are the size of a quarter or when leaves reach 8 to 10 inches in length. Wash and refrigerate.

Squash

Harvest yellow crookneck squash when fruit is 4 to 6 inches in length but still immature. For yellow straight-neck squash, harvest when 6 to 8 inches long; white scallop, 3 to 4 inches in diameter. Glossy color indicates tenderness. Harvest winter squash when fruits are full size and the rind is firm, glossy and creamy to orange where the fruit touches the soil. Light frost will not damage mature fruits. Squash, like cucumbers, are susceptible to chilling injury. Therefore, do not store in the refrigerator for more than 2 to 3 days.

Tomatoes

Harvest when they are fully colored but still firm. Tomatoes can be harvested when a faint red color appears at the blossom end. Then store in a warm place to mature. Harvest at full red stage for the best flavor. Store ripe tomatoes in the refrigerator.

Turnips

Harvest when roots are 1 1/2 to 2 1/2 inches in diameter but before heavy fall frosts. Greens are harvested when leaves are 4 to 6 inches in length. Keep topped turnips cold and humid.

APPENDIX

Suggested Vegetable Varieties for Texas

CROP	SUGGESTIONS
ASPARAGUS	UC 157, UC 72, UC 500W, UC 72, Jersey Gem, Jersey Giant, Jersey Centennial
BEAN	<i>Green:</i> Benchmark, Blue Lake 274, Derby, Jade, Landmark, Opus, Strike <i>Flat pod:</i> Calgreen, Magnum, Roma II <i>Pinto:</i> Cinnabar, Bill Z., Fiesta, Othello, Pinata III, Pinray, U.I. 126
BEET (TABLE)	Detroit Dark Red S.T., Red Ace, Red Cloud, Warrior
BROCCOLI	Everst, Heritage, Liberty, Sultan, Marathon, Patriot, Signal, Triathlon
CABBAGE	Blue Vantage, Bravo, Cheers, Emblem, Fortress, Pennant, Solid Blue 790, Solid Blue 760, Vantage Point, Blue Thunder <i>Red Type:</i> Cardinal, Red Jewel, Red Rock, Red Rookie, Rio Grande Red
CANTALOUPE	Caravelle, Chaparral, Cimaron, Copo deOrio, Cruiser, Early Delight, Gold Rush, Impak, Hy-Mark, Mission, Primo, Ovation, Progresso, Super 45 <i>Open Pollinated:</i> TAMUvalde, Perlita, Mainstream
CARROT	Big Shot, Candy Stix, Caropak, Cheyenne, Choctaw, Navajo, Sugar Snax, Vita-Sweet, SCR 7180, SCR 7248
CAULIFLOWER	Candid Charm Gaudian, Imperial 10-6, Incline, Minuteman, Snowball Y Imp., Snow Crown, White magic, Snowman <i>Green Type:</i> Alverde, Macerata, Green Harmony, Spiral Point
CELERY	Florida 683, Rocket, Starlet, Summer or Giant Pascal, Utah 52-70
COLLARD	Champion, Flash, Top Bunch, Vates
COWPEA (SOUTHERN PEA)	<i>Pinkeye:</i> Texas Pinkeye, Purple Hull, Pinkeye Purple Hull BVR, Pinkeye Purple Hull, Coronett <i>Blackeye:</i> Blackeye #5, Arkansas #1, Blackeye #46 <i>Cream:</i> Cream 40 <i>Crowder:</i> Brown Sugar, Mississippi Silver, Zipper <i>Greenhouse:</i> Bruneva, Brunex, Vitomil
CUCUMBER	<i>Slicer:</i> Conquistador, Dasher II, Daytona, General Lee, Indy, Panther, Pointsett 76, Raider, Slice Master, Slice Nice, Supersett, Sprint 440 II, Tunderbird, Turbo <i>Pickling:</i> Calypso, Carolina, Fancypak M, Flurry, Jackson, Royal
EGGPLANT	Black Bell, Black Magic, Epic, Classic, Florida High Bush, Florida Market, Night Shadow <i>Oriental type:</i> Ichibon, Tycoon
GARLIC	<i>Soft neck type:</i> California Early, California Late, Mexican Pink, Creole, Texas White <i>Eggplant type (not true garlics):</i> Oriental garlic <i>Hardneck type:</i> Roja, German Red, Valencia
LETTUCE	<i>Crisp Head:</i> Great Lakes 659 MT, Mission <i>Loose Leaf:</i> Flame, Grand Rapids, Prizehead, Red Sails, Salad Bowl, Two Star, Waldeman's Green <i>Butter head:</i> Buttercrunch <i>Romaine:</i> Valmine, Paris Island
HONEYDEW MELON	Honeybrew, Megabrew, Morning Ice
KALE	Blue Armor, Blue Arrow, Blue Knight, Dwarf Scotch, Vates, Imp. Dwarf Siverian
MUSTARD GREEN	Green Wave, Tendergreen, Southern Giant Curl, Florida Broadleaf
OKRA	Clemson Spineless, Lee, Emerald, Clemson 80, Green Best, Cajun Delight, Lee <i>Compact Type:</i> Annie Oakley, Prelude, Blondy
ONION	<i>Short Day :</i> <i>Yellow</i> – Chula Vista, Cougar, Diamante, Encino, Jaguar, Linda Vista, Marquesa, Mercedes, Riojas, Sweet Sunrise, TX 1015, 6996 <i>Red</i> – Rio, Rio Santiago, <i>White</i> – Diamante, Krystal, Texas Early White

Suggested Vegetable Varieties for Texas. (Continued)

CROP	SUGGESTIONS
	<p>Intermediate Day: <i>Yellow</i> – Caballero, Cimarron , Riviera , Sierra Blanca, Utopia, Yula <i>Red</i> – Fuego <i>White</i> – Alabaster, Duro, Spano,</p> <p>Long Day: <i>Yellow</i> – Armada, Blanco Duro, Capri, Durango, El Charo, Ole', Seville, Sweet Perfection,Valdez, Vega, Vaquero <i>Red</i> – Tango <i>White</i> – Sterling</p>
PEPPER	<p>Bell: Aladdin, Capistrano, Camelot X3R, Early Sunsation, Jupiter, Pip, Red Knight, Summersweet 840, Taurus, Valiant, X3R Wizard Jalapeno: Coyama, Grande, Mitla, Ole, Perfecto, TAM Mild-1, TAM Veracruz, Tula, Tulleon, Summer Heat 5000, Summer Heat 6000, X3R-Ixtapa, Spp 7603</p> <p>Serrano: Fiesta, Tampico, Tuxtlas Cayenne: Mesilla Anaheim: Sonara</p>
POTATO	<p>Russet: Russet Norkatah, Norgold M, Century Russet White: Alantic, Gemchip, Chipeta, Kennebec Red: Red LaSoda, Viking, Pontiac Yellow Flesh: Yukon Gold</p>
PUMPKIN	<p>Mini: Jack-Be-Little, Munchkin, Pro Gold 100 Small: Small Sugar, Triple Treat, Streaker, Pro Gold 300, Oz, Spookie Large: Appalachin, Connecticut Field, Ghost Rider, Howden, Happy Jack, Magic, Pro Gold 500, Pro Gold 510, Trickster, Wizard Mammoth: Atlantic, Giant, Big Mac, Big Max, Howden Biggie, Prizewinner</p>
SPINACH	<p>Fresh: Fall Green, Samish, Winter Green (Ark 88-310) Processing: ACX 5044, F 380, ACX 3633, ACX 2615, 6710157</p>
SQUASH (YELLOW)	<p>Straight Neck: General Patton, Golden Girl, Goldbar, Gold Spike, Lemon Drop L., Multipik, PS- 391 Crook Neck: Bandit, Dixie, Early Golden, Freedom II, Goldslice, Goldie, Liverator III, Medallion, Meigs, Prelude II, Pavo, Supersett, Sunrise Zucchini: Commander, Enterprise, Independence II, President, Senator, ACX 34</p>
SWEET CORN	<p>Standard: Merit Y, Jubilee Y, Silver Queen W Se: Calico Belle B, Guadalupe Gold, Kandy Korn, Snowbelle w, Sweet G-90 B, Temptation B, Sh₂: Challenger Y, Dazzle, Even Sweeter W, Endeavor Y, Florida Staysweet Y, Pouchline Y, Summersweet 7710 Y, Sweetie 82 Y, Frontier W, Summersweet 7211 W, Summersweet 7210Y, Summersweet 8102 B Se X Sh₂: Sweet Ice, Sweet Symphony, Sweet Rhythm</p>
SWEET POTATO	<p>Orange flesh: Beuregard, Jewel, Excel, Hernandez Gold flesh: Shore Gold White flesh: Sumor, White Delight</p>
TOMATO	<p>Bingo, Carnival, Celebrity, Florida 51, Merced, Sanibel, Spitfire, Sunbeam, Sunrise, Summer Flavor 5000 Heat set: ACX 12, Florida 91, Florasette, Heatwave, Sunchaser Processing: ACX 8625, Aztec, Casa Del Sol, Chico III, Ohio 8245, TX III, XP 671, Yaqui</p>
TURNIP	<p>Greens: All Top, Alamo, Topper Roots: Purple Top White Globe, Royal Globe, Shogoin, York, Seven Top, Tokyo Cross, White Lady, Royal Crown</p>
WATERMELON	<p>Hybrids: Big Stripe, Royal Sweet, Royal Flush, Sentinel, Stargazer, Stars-N-Stripes, Summer Flavor 800, Summergold Y Seedless (Triploids): Crimson Trio, Tri X313, Carousel, Revolution, Summer Flavor 5244 Open Pollinated: Allsweet, Jubilee II, Legacy</p>

Common Garden Problems

Symptoms	Possible cause	Corrective measures
Plants stunted in growth; sickly, yellow color	Abnormal pH or inadequate soil fertility	Soil test and fertilize according to results or apply 2 to 3 pounds of a complete fertilizer/100 sq. ft. of bed.
	Plants growing in compacted poorly drained soil	Modify soil with organic matter or coarse sand.
	Insect or disease injury	Apply insecticide or fungicide.
	Iron deficiency	Apply iron chelate to soil or foliage.
Plants stunted in growth; sickly, purplish color	Low temperature	Plant at proper time. Do not use light colored mulch too early in season.
	Cold soils, phosphorous deficiency	Apply proper phosphorous rates at planting. Warm weather often cures problem.
Holes in leaves; leaves yellowish and drooping or distorted in shape	Insect damage	Apply appropriate insecticides at regular intervals.
Leaves with spots, dead, dried areas; or powdery or dusty areas	Plant diseases	Plant resistant varieties; remove diseased plants and apply appropriate fungicides.
Plants wilt even though sufficient soil moisture is present	Soluble salts too high	Have soil tested for salt content.
	Poor drainage and/or aeration	Add organic matter or sand to soil.
	Soil insects, diseases or nematodes	Plant resistant varieties; apply soil insecticide, rotate garden site, fumigate garden site well in advance of planting.
Plants tall, spindly and unproductive	Excessive shade	Relocate garden site to sunny area; remove trees or tall shrubs, keep down weeds.
	Excessive nitrogen fertilization	Reduce future nitrogen application.
Blossom drop of tomatoes	Excessive humidity or temperature during bloom	Use mulch and frequent irrigation. Plant heat tolerant varieties.
	Minor element deficiencies	Apply fertilizers containing iron, zinc and manganese.
Failure of vine crops to set fruit	Poor pollination	Avoid spraying when bees are present.
Leathery, dry, brown blemish on the blossom end of tomatoes, peppers and watermelons	Blossom end rot over-watering and excessive nitrogen. Calcium nitrate sprays or injections into irrigation water.	Maintain uniform soil moisture. Avoid

Planting Guide

Vegetable	Seed, plants /100'	Inches plant depth	Plant Spacing		Feet plant height	Average planting date */		Days to harvest	Length harvest season	Lbs. yld/100' row
			Plant rows	In-row		Spring	Fall			
Paragus plants seed	66	6-8 1 oz.	36-48 1-1.5	18	5	4-6 wks prior	not recommended	730	60	100 fruits
Beans, green	0.5 lb.	1-1.5	30-36	3-4	1.5	on-4 wks. after	8-10 wks. before	45-60	14	120
Beans, pole	0.5 lb.	1-1.5	36-48	4-6	6	on-4 wks. after	14-16 wks. before	60-70	30	150
Beans, bush	0.5 lb.	1-1.5	30-36	3-4	1.5	on-4 wks. after	8-10 wks. before	65-80	14	25
Beans, pole	0.5 lb.	1-1.5	36-48	12-18	6	on-4 wks. after	14-16 wks. before	75-85	40	50
Beets	1 oz.	1	14-24	2	1.5	4-6 wks. prior	8-10 wks. before	50-60	30	150
Broccoli	0.25 oz.	0.25	24-36	12-18	2	4-6 wks. prior	10-16 wks. before	60-80	40	100
Brussels sprouts	0.25 oz.	0.25	24-36	14-24	2	4-6 wks. prior	10-14 wks. before	90-100	21	75
Cabbage	0.25 oz.	0.25	24-36	14-24	1	4-6 wks. prior	10-16 wks. before	60-90	40	50
Cabbage, Chinese	0.25 oz.	0.25	24-36	14-24	1	4-6 wks. prior	12-14 wks. before	65-70	21	80 heads
Cantaloupe	0.5 oz.	0.75	60-96	12-24	1	on-6 wks. after	14-16 wks. before	85-100	30	100 fruits
Carrots	0.5 oz.	0.125	14-24	1-2	1	4-6 wks. prior	12-14 wks. before	70-80	21	100
Chicory	0.25 oz.	0.25	24-36	12-18	2	not recommended	10-16 wks. before	70-90	14	100
Chard, Swiss	2 oz.	0.75	18-30	6	1.5	2-6 wks. prior	12-16 wks. before	45-55	40	75
Collard/kale	0.25 oz.	0.125	18-36	6-12	2		8-12 wks. before	50-80	60	100
Corn, sweet	3-4 oz.	1-2	24-36	9-12	6	on-6 wks. after	12-14 wks. before	70-90	10	10 dozen
Cucumber	0.5 oz.	0.75	48-72	8-12	1	4-6 wks. prior	0-12 wks. before	50-70	30	120
Eggplant	0.125 oz.	0.5	30-36	18-24	3	not recommended	12-16 wks. before	80-90	90	100
Garlic	1 lb.	1-2	14-24	2-4	1	2-6 wks. prior	4-6 wks. before	140-150	—	40
Ghribabi	0.25 oz.	0.5	14-24	4-6	1.5	6 wks. prior to	12-16 wks. before	55-75	14	75
Lettuce	0.25 oz.	0.125	18-24	2-3	1	2 wks. after	10-14 wks. before on-6 wks. after	40-80	21	50
Mustard	0.25 oz.	0.25	14-24	6-12	1.5	2-6 wks. after	10-16 wks. before	0-40	30	100
Kraut	2 oz.	1	36-42	12-24	6	4-10 wks. before	12-16 wks. before	55-65	90	100
Onion, sets	400-600	1-2	14-24	2-4	1.5	6-8 wks. before	not recommended	80-120	40	100
Onion, seed	1 oz.	0.25	14-24	2-4	1.5	on-6 wks. before	8-10 wks. before	90-120	40	100
Parsley	0.25 oz.	0.125	14-24	2-4	.5		6-16 wks. before	70-90	90	30
Peas, Southern	0.5 lb.	2-3	24-36	2-4	2.5		10-12 wks. before	60-70	30	40
Pepper	0.125 oz.	0.75	18-24	12-18	2.5	2-10 wks. after 1-8 wks. after	12-16 wks. before	60-90	90	60
Potato, Irish	6-10 lbs.	3-4	30-36	9-12	1	4-6 wks. before	14-16 wks. before	75-100	—	100
Potato, sweet	75-100 plants	3-5	36-48	12-16	1	2 to 8 wks after 1-4 wks. after	not recommended	100-130	—	100

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			Plant rows	In-row		Spring	Fall			
Beans, green	0.5 lb.	1-1.5	30-36	3-4	1.5	on-4 wks. after	8-10 wks. before	45-60	14	120
Chickpea	0.5 oz.	0.75-1	60-96	36-48	1	6 wks. before/ 4 wks. after	12-14 wks.	75-100	—	100
Edamame	1 oz.	0.5	14-24	1	.5	1-8 wks. before	on-8 wks. before	25-40	7	100 bunches
Garbanzo	1 oz.	0.75	14-24	2-6	1		2-16 wks. before	40-60	40	3 bushels
Lima, butter	1 oz.	1-2	36-60	18-36	3	1-4 wks after	12-15 wks. before	50-60	40	150
Lima, runner	0.5 oz.	1-2	60-96	24-48	1	on- 8 wks. after	12-14 wks. before	85-100	—	100
Maternal plants	50 plts.	4-6	36-48	24-48	3		12-14 wks. before	70-90	—	100
Peas, snap	0.5 oz.	0.5	14-24	2-3	1.5	6 wks. before/ 4 wks. after	2-14 wks. before	30	40	5-100
Peas, shelling	0.5 oz.	0.5	72-96	2-3	1.5	2-6 wks. before on-6 wks. after	2-14 wks. before	30-60	30	50-100
Watermelon	1 oz.	0.75		36-72	1		14-16 wks. before	75-90	30	40 fruits

Based on days before or after average frost free date in your area.

GLOSSARY OF TERMS

(Adapted from Gardener's network =
www.gardenersnet.com/atpz/diction.htm)

- Annual:** A plant that completes its life cycle in one year or growing season.
- Banding:** Application of a chemical, seed or fertilizer etc. in a band or strip at a prescribed depth or width.
- Bed:** The raised surface of a garden site on which seeds or seedlings are planted.
- Bedding:** The process of building the bed.
- Biennial:** A plant that completes its life cycle in 2 years or growing seasons.
- Broadcasting:** Application of a chemical, seed or fertilizer over the entire plant bed or garden area.
- Coldframe:** A structure constructed of wood, cinder block etc. and covered with glass frames or plastic and used to grow seedlings for transplanting during cold weather. Sometimes may have heating cables etc. at the soil surface to provide bottom heat.
- Companion planting:** A cropping technique in which two crops are planted within the same garden space in close proximity to each other to provide a mutual benefit.
- Container gardening:** Growing vegetables in pots, cans, planter boxes, etc. Good for apartment dwellers or for homes with limited space.
- Crop rotation:** Planting a series of non-related vegetable species in the same garden site over a 3 to 5 year cycle to reduce the incidence of soil-borne diseases.
- Days to maturity:** The number of days from planting to harvest date.
- Floating row covers:** Light-weight, spun bound polyester or polypropylene materials loosely draped over beds to protect plants from frost injury.
- Friable:** A soil condition characterized by soft crumbly soil particles.
- Frost-free days:** The actual number of days in an area during which plants can be grown without the danger of injury from frost.
- Furrow:** The depressed area between raised soil beds or any groove in a bed surface.

- Germination:** The process in which growth is initiated within the seed or when the radicle (root tip) emerges through the seed coat.
- Hardening off:** A condition in which seedling plants grown in a green house, hotbed or cold frame are exposed to the exterior elements for periods of time prior to field setting in an attempt to acclimate them to field conditions.
- Hill planting:** A planting technique in which several seeds are placed at an appropriate distance on or just below the bed surface and covered with $\frac{1}{2}$ to 1 inch of soil. Once seedlings emerge, the "hill" is thinned to one plant.
- Leach or leaching:** The movement of nutrients or salts downward from the rooting zone through the soil profile.
- Leggy:** Seedlings that are excessively elongated.
- Manure:** Animal waste used as a fertilizer.
- Maturity date:** The average date when a crop is expected to reach acceptable harvest quality.
- Perennial:** A plant that grows or normally lives 3 or more years.
- pH:** A relative scale (1-14) reflecting the hydrogen ion concentration in the soil. This determines if a soil is acid, neutral or alkaline (7 = neutral soil, below 7 = acid soil, above 7 = alkaline soil).
- Raised beds:** A technique used to raise the seeding zone above the natural surface of the soil to provide improved aeration and drainage. In home gardens, this is usually accomplished by building retaining walls 12" to 18" in height and filling with a growing medium.
- SE:** New varieties of corn that have been bred to contain extremely high sugar content (sugar enhanced).
- Seed bed:** Two types of seed beds; an area used to produce seedlings for transplanting and the actual area in which seeds are sown or transplants are established.
- Seed tape:** A biodegradable tape with pre-spaced seed attached. The tape is rolled out in a planting furrow and covered with soil. This allows for easy uniform seed spacing, especially of small vegetable seeds.
- SH₂:** Varieties of corn that contain sugars that do not readily change to starch, consequently do not require refrigeration to retain their sweet flavor.
- Side dress:** Applying fertilizer or pesticides to the side of a plant either on the bed surface or approximately 2 inches below the surface.

Sour soil: Highly acid soil.

Sweet soil: Highly alkaline soil.

Soluble: The property that allows for compounds such as fertilizers to be dissolved in the soil water phase, which enables plants to absorb them.

Succession planting: A planting technique used to spread the planting and harvesting periods over longer periods of time. It is usually done in increments of one or two weeks.

Tilth: The ability to pulverize the soil.

Transplant: A seedling used to establish a crop in a location other than where it was grown.

Transplanting: Establishing a crop with seedlings.

Transplant shock: The condition experienced by a seedling when removed from the protected environment of a growing structure to the harsh conditions in the field. Growth is slowed until the seedling is able to acclimate to the field conditions.

Viability: The ability of a seed to germinate once placed in a favorable growing environment.

Handy Conversions

3 teaspoons = 1 tablespoon

2 tablespoons = 1 fluid ounce

16 tablespoons = 1 cup

2 cups = 1 pint (16 ounces)

2 pints = 1 quart

4 quarts = 1 gallon

1 ounce = approximately 2 tablespoons
dry weight

Home Gardening Do's and Don'ts

Do

- Use varieties recommended for your area of the state.
- Obtain soil tests on samples from garden site every 2 to 3 years.
- Apply pre-plant fertilizers to the garden site based on soil sample results.
- Examine garden often to prevent potential problems or correct problems as soon as they become evident.
- Keep garden free of insects, disease and weed infestations.
- Use mulches to conserve moisture, control weeds and reduce rot of fruit that touches the bed surface.
- Water as needed and wet to a depth of 6 inches.
- Thin plants when they are small and still seedlings.
- Avoid excessive walking and working in the garden when the foliage and soil are wet.
- Wash and clean garden tools, sprayers and other equipment after each use.
- Keep records on garden activities.

Do not

- Depend on varieties not recommended for your area, and try only small amounts of any new variety.
- Plant so closely that you cannot walk or work in the garden.
- Cultivate so deeply that plant roots are pruned or injured.
- Shade small plants with taller growing crops.
- Water excessively or late in the afternoon.
- Place fertilizer directly in contact with plant roots or seeds.
- Allow weeds to become large and well established before cultivating.
- Apply chemicals or pesticides in a haphazard manner or without reading the label directions.
- Use chemicals not recommended for specific garden crops.
- Store unused diluted sprays.

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Other Extension Gardening Publications

- B- 6102 Building a Raised Bed Garden
- B- 1252 Insect Control Guide for Organic Gardener
- B- 1300 Managing Insect and Mite Pests in Vegetable Gardens
- B- 5078 Earth Kind Gardening Guides
- B- 1613 Specialty Vegetables in Texas
- L- 2242 Growing Herbs in Texas
- L- 2016 Non-Chemical Control of Plant Diseases in the Home Garden
- L- 781 Control of Plant Parasitic Nematodes Around the Home and Garden
- MP-1150 Vegetable Gardening in Containers
- MP- 954 Disease Prevention in the Home Garden
- Series Easy Gardening Guides: Asparagus-Watermelon

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